Pilot Testing of Mercury Oxidation Catalysts for Upstream of Wet FGD Systems

Quarterly Technical Progress Report

July 1, 2005 – September 30, 2005

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ABSTRACT

This document summarizes progress on Cooperative Agreement DE-FC26-01NT41185, "Pilot Testing of Mercury Oxidation Catalysts for Upstream of Wet FGD Systems," during the time-period July 1, 2005 through September 30, 2005. The objective of this project is to demonstrate at pilot scale the use of solid honeycomb catalysts to promote the oxidation of elemental mercury in the flue gas from coal combustion. The project is being co-funded by the U.S. DOE National Energy Technology Laboratory under Cooperative Agreement DE-FC26-01NT41185. EPRI, Great River Energy (GRE), and City Public Service (CPS) of San Antonio are project co-funders. URS Group is the prime contractor.

The mercury control process under development uses honeycomb catalysts to promote the oxidation of elemental mercury in the flue gas from coal-fired power plants that have wet lime or limestone flue gas desulfurization (FGD) systems. Oxidized mercury is removed in the wet FGD absorbers and collected with the byproducts from the FGD system. The current project is testing previously identified catalyst materials at pilot scale to provide engineering data for future full-scale designs. The pilot-scale tests are being conducted for 14 months or longer at each of two sites to provide longer-term catalyst life data.

This is the sixteenth, and final reporting period for the subject Cooperative Agreement. Operation of the first pilot unit at the GRE Coal Creek site was concluded in 2004. That pilot unit was shipped to TXU Generation Company LP's Monticello Steam Electric Station, for mercury oxidation catalyst testing as part of NETL project DE-FC26-04NT41992.

For the second pilot unit, at Spruce Plant, testing was concluded in May 2005, and the pilot unit was shipped to URS' office in Austin, Texas for minor refurbishment. During the current quarter, the refurbishment was completed and the pilot unit was shipped to Southern Company's Georgia Power Plant Yates for mercury oxidation catalyst testing as part of NETL project DE-FC26-04NT41992.

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INTRODUCTION

This document is the quarterly Technical Progress Report for the project "Pilot Testing of Mercury Oxidation Catalysts for Upstream of Wet FGD Systems," for the time-period July 1, 2005 through September 30, 2005. The objective of this project is to demonstrate at pilot scale the use of solid honeycomb catalysts to promote the oxidation of elemental mercury in the flue gas from coal combustion. The project is being co-funded by the U.S. DOE National Energy Technology Laboratory under Cooperative Agreement DE-FC26-01NT41185. EPRI, Great River Energy (GRE) and City Public Service (CPS) of San Antonio are project co-funders. URS Group is the prime contractor.

The mercury control process under development uses honeycomb catalysts to promote the oxidation of elemental mercury in the flue gas from coal-fired power plants that have wet lime or limestone flue gas desulfurization (FGD) systems. The oxidizing species are already present in the flue gas, and may include chlorine, hydrochloric acid (HCl), oxygen and/or other species. Oxidized mercury is removed in the wet FGD absorbers and is captured with the FGD byproducts. The objective of this project is to test previously identified catalyst materials at pilot scale to provide engineering data for future full-scale designs. The pilot-scale tests are being conducted for 14 months or longer at each of the two sites to provide longer-term catalyst life data. After completing the project, it is expected that sufficient full-scale test data will be available to design and implement demonstration-scale installations of the catalytic mercury oxidation technology.

The two utility team members have provided co-funding, technical input, and host sites for testing as part of this project. GRE provided the first test site at their Coal Creek Station (CCS), which fires North Dakota lignite, and CPS provided the second site at their J.K. Spruce Plant, which fires Powder River Basin (PRB) subbituminous coal. These two host sites each have existing wet FGD systems downstream of high-efficiency particulate control devices, an ESP at CCS and a reverse-gas fabric filter (baghouse) at Spruce**.**

Testing was completed at the first site in 2004, but continued at the second site, CPS' Spruce Plant into May 2005. In May, the oxidation catalyst pilot unit at Spruce Plant was shut down, disconnected from the host site ductwork, and shipped off site, to be used at Southern Company's Plant Yates as part of NETL project DE-FC26-04NT41992. There was no technical progress to report from Spruce during this, the last quarter of the project.

The remainder of this report is divided into five sections: an Executive Summary followed by a section that describes Experimental procedures, then sections for Results and Discussion, Conclusions, and References.

EXECUTIVE SUMMARY

Summary of Progress

The current reporting period, July 1, 2005 through September 30, 2005, is the sixteenth and final technical progress reporting period for the project. During this period, there was no testing at the first pilot unit site, at the GRE Coal Creek Station, and no related project efforts. For the second pilot unit at CPS' Spruce Plant, the catalyst pilot unit completed its term of operation during the previous quarter, and was shut down and removed from the host site for use on a second DOE Cooperative Agreement.

Two presentations of project results were made during the quarter. One presentation was at the DOE-NETL mercury program review meeting in Pittsburgh in July, and the second was at the Air Quality V symposium in Arlington, Virginia in September. There was no other technical progress during the current quarter.

Problems Encountered

There were no significant problems encountered during the reporting period.

Plans for Next Reporting Period

The project period of performance ended at the end of the current reporting period (September 30, 2005), so no testing is scheduled at either of the two sites. Both pilot units have been shut down and moved to new sites as part of the 41992 project. The only remaining effort for this project is submittal of the final report.

EXPERIMENTAL

The work conducted during this project used two elemental mercury catalyst oxidation pilot units (8000 acfm of flue gas treated) located at GRE's Coal Creek Station in North Dakota and at CPS' Spruce Plant in Texas. Each pilot unit has four separate compartments that allow four different catalysts to treat flue gas from downstream of the host plant's particulate control device and upstream of its FGD system. Details of the pilot unit design, construction, catalyst preparation and pilot unit operation have been discussed in previous quarterly technical progress reports[1,2, 3, 4].

The activity of these catalysts is determined by measuring the change in elemental mercury concentration across each catalyst, while ensuring that the total mercury concentrations do not change significantly across the catalyst. These measurements are primarily being conducted using a mercury semi-continuous emissions monitor (SCEM) developed with funding from EPRI. The analyzer has been described in a previous report[5]. Periodically, the analyzer results are being verified by conducting manual flue gas sampling efforts in parallel across each catalyst chamber by the Ontario Hydro method.

RESULTS AND DISCUSSION

There are no new technical results to report for the current period, July 1 through September 30, 2005.

CONCLUSION

There are no new conclusions to be made, as there was no technical progress during the current quarter.

REFERENCES

1. Blythe, Gary M. "Pilot Testing of Mercury Oxidation Catalysts for Upstream of Wet FGD Systems," Quarterly Technical Progress Report, October 1, 2002 – December 31, 2002. Cooperative Agreement No. DE-FC26-01NT41185, URS Corporation, Austin, Texas 78729. January 2003.

2. Blythe, Gary M. "Pilot Testing of Mercury Oxidation Catalysts for Upstream of Wet FGD Systems," Quarterly Technical Progress Report, July 1, 2002 – September 30, 2002. Cooperative Agreement No. DE-FC26-01NT41185, URS Corporation, Austin, Texas 78729. October 2002.

3. Blythe, Gary M. "Pilot Testing of Mercury Oxidation Catalysts for Upstream of Wet FGD Systems," Quarterly Technical Progress Report, March 1, 2002 – June 30, 2002. Cooperative Agreement No. DE-FC26-01NT41185, URS Corporation, Austin, Texas 78729. July 2002.

4. Blythe, Gary M. "Pilot Testing of Mercury Oxidation Catalysts for Upstream of Wet FGD Systems," Quarterly Technical Progress Report, January 1, 2002 – March 31, 2002. Cooperative Agreement No. DE-FC26-01NT41185, URS Corporation, Austin, Texas 78729. April 2002.

5. *Enhanced Control of Mercury by Wet Flue Gas Desulfurization Systems, Final Report, Phase II*, U.S. Department of Energy Cooperative Agreement Number DE-AC22-95PC95260, URS Corporation, Austin, Texas 78729. June 2001.